

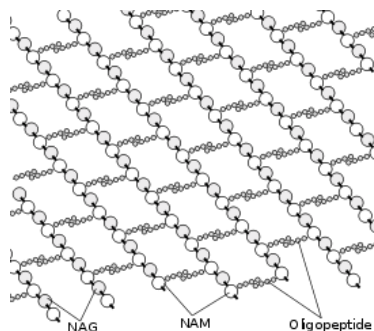
Bacteria

Kingdom Eubacteria and Kingdom Archaeobacteria

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- Eubacteria contain bacteria cells with cell walls made of peptidoglycan.

- **Peptidoglycan** - made of sugar and amino acids. It forms a mesh like wall around bacteria



- Archaeobacteria contain bacteria with cell walls not composed of peptidoglycan.
- Bacteria can be found anywhere! Many of them live in places where no other forms of life can survive! (Archaeobacteria)

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What we already know

Characteristics:

- Prokaryotic → no membrane-bound organelles
- Single-celled or colonial (All of the cells are identical)
- Heterotrophic or autotrophic

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Different Types of Bacteria

Bacteria cells are usually one of three different shapes:

- Rods (bacillus)
- Spheres (coccus)
- Spirals (spirillum)



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Bacteria can be arranged in several ways:

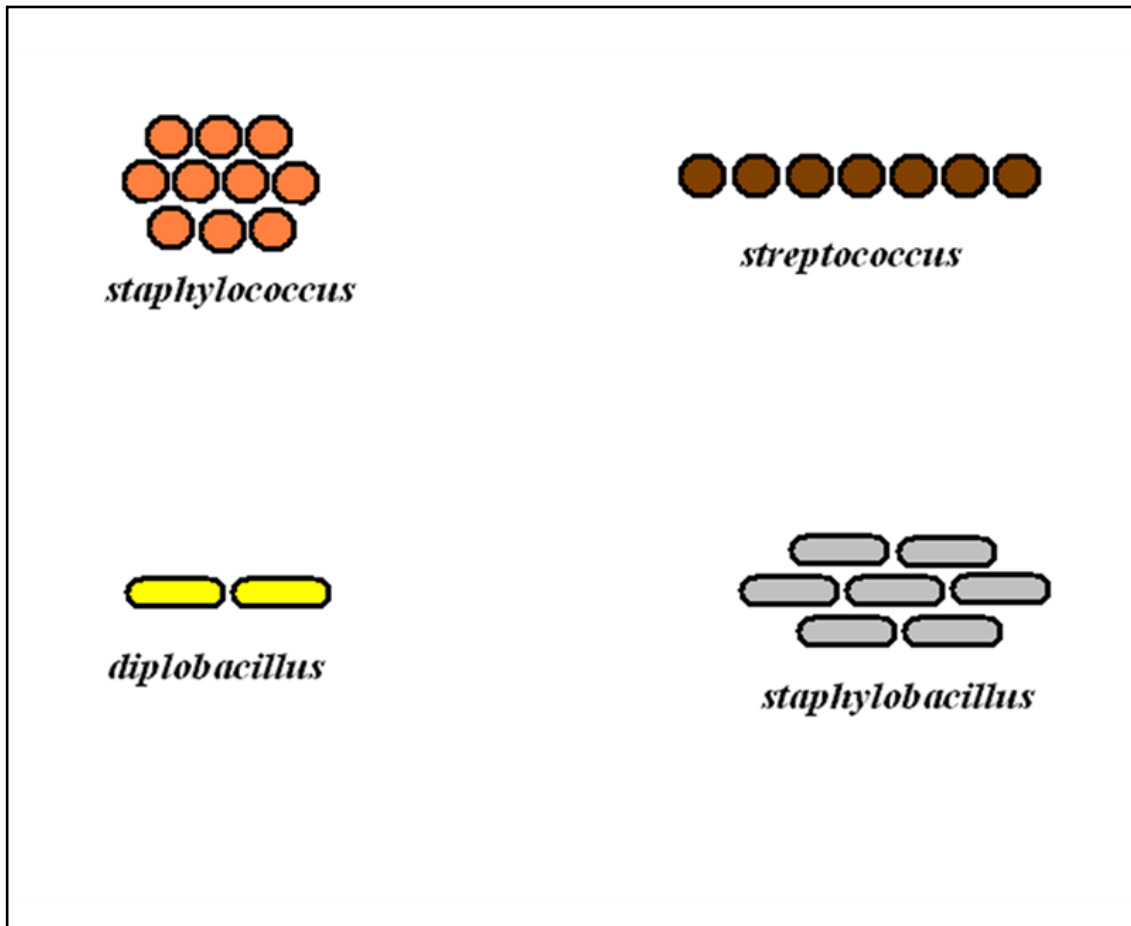
- 2 cells: **diplo**
- A strand of cells: **strepto**
- A cluster of cells: **staphylo**

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Naming Bacteria

- When naming bacteria, we name them based on their arrangement and their shape.
- The first part of the name represents the arrangement. The second part represents the shape.
- EX. Two rod-shaped cells
 - Diplobacillus
- EX. Spherical cells in a linear strand
 - Streptococcus

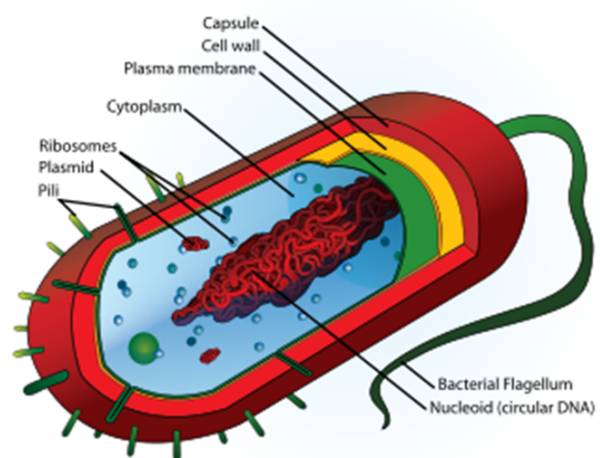
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Bacteria Structure

- Nucleoid
- Plasmid
- Ribosomes
- Plasma Membrane
- Cell Wall
- Flagella
- Pili



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- Bacterial DNA is not contained in a nucleus (remember....no membrane-bound organelles!)
- Instead, the DNA is tangled up in an area we call the **nucleoid**.
- Bacterial DNA forms loops - Known as plasmids

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Bacteria cells are classified based on how they react to a certain chemical stain developed by Dr. Gram.

Gram positive - They retain a purple color when stained with crystal violet.

Other bacteria cells have different cell walls and react differently to the Gram stain

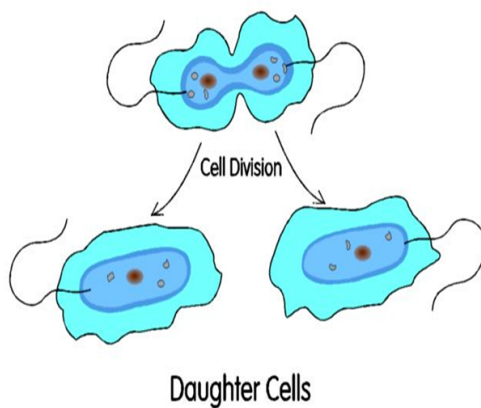
- These bacteria are known as **Gram negative** because they do not stain purple.
- How they stain determines what antibiotic is prescribed.

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- Bacteria may achieve motility in three ways:
 - Using flagella
 - An axial filament (bacteria cell moves like a corkscrew)
 - Slime

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Bacterial Cells Reproduction



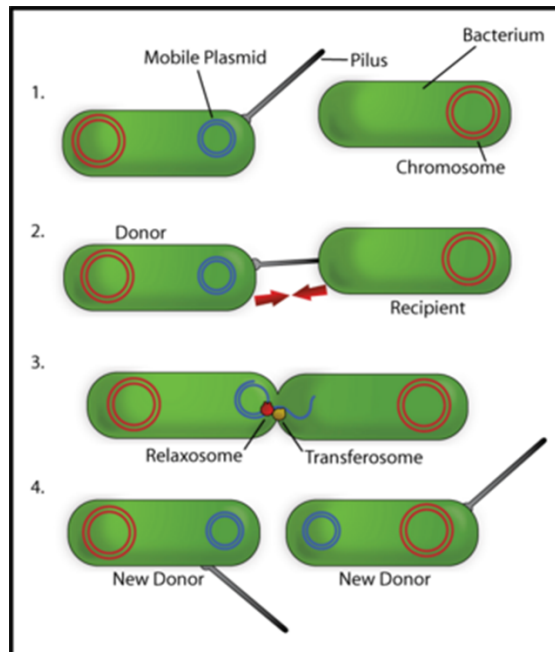
Binary Fission - one cell dividing to produce two identical daughter cells

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Bacterial Reproduction

Bacterial
Conjugation
aka
Horizontal
Gene Transfer

Conjugation Video



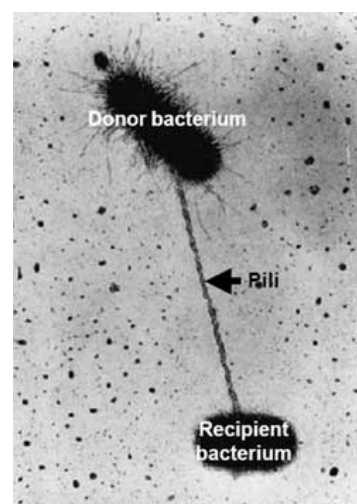
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Bacterial Conjugation

The connection that is formed between two bacteria cells is known as the **conjugation bridge**.

The structure that forms the conjugation bridge is called a **pili**.

The plasmid that gets transferred is known as the **F plasmid** or the sex plasmid.



Conjugation Video 2



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Examples of Good Bacteria

Bacteria can be used for:

- **Food production (cheeses, yogurt, alcohol ...)**
- **Making medicines (insulin)**
- **Recycling**

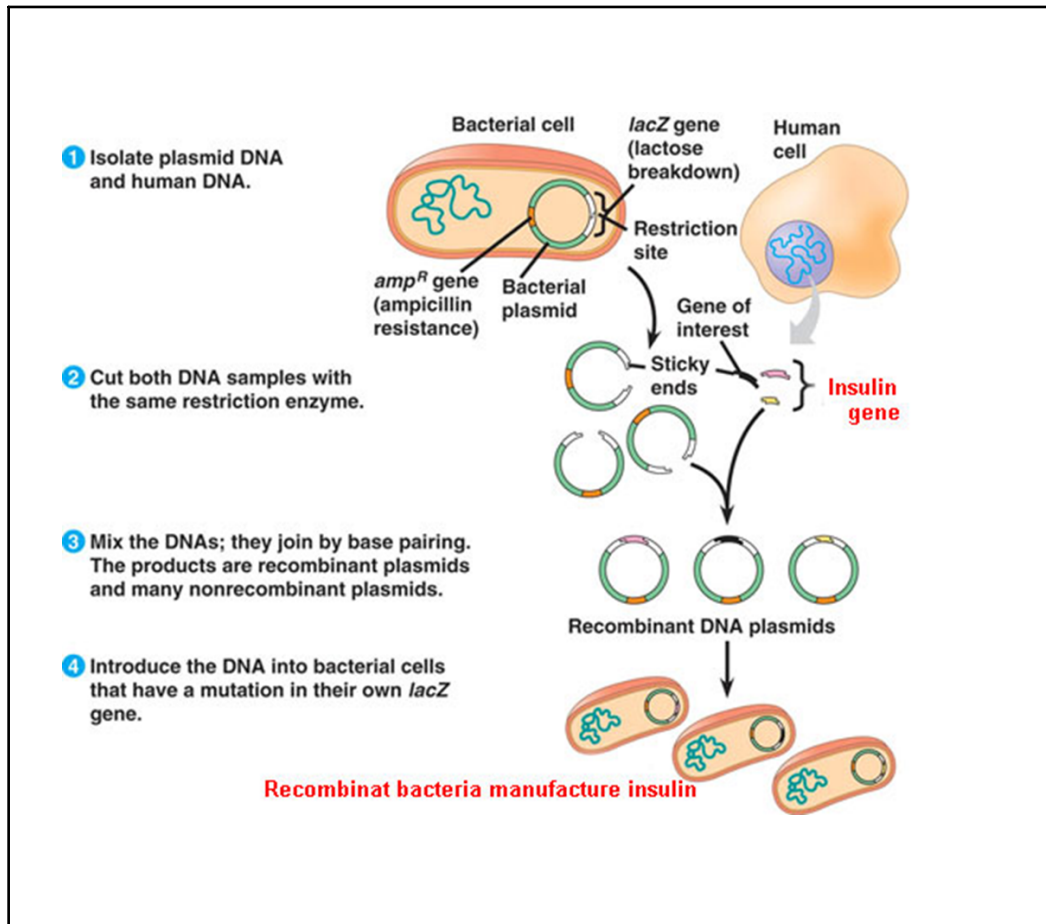
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Insulin Production in Bacteria

Genetic Recombination:

- The gene responsible for insulin production in humans is removed.
- The plasmid in the bacteria cell is opened.
- The human gene is inserted into the plasmid.
- The bacteria cell reads the new gene along with it's own DNA and becomes an insulin-producing factory!
- Insulin is removed from the bacteria cells and given to individuals with diabetes!

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Bacteria and Vitamins

- Vitamin B12 is synthesized exclusively by bacteria through a process called fermentation.
- Vitamin B12 is necessary for the synthesis of red blood cells, the maintenance of the nervous system, and growth and development in children.

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Bad Bacteria

- **Are pathogenic (cause disease)**
- **Most are parasitic which cause infections.**
- **Antibiotics are used to treat these infections. An antibiotic is a chemical agent produced by one organism that is harmful to another organism. One of the most popular antibiotics is Penicillin which comes from a fungus. It destroys the bacteria's cell wall & therefore causes the cell membrane to break up due to the hypotonic environment.**

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Anthrax

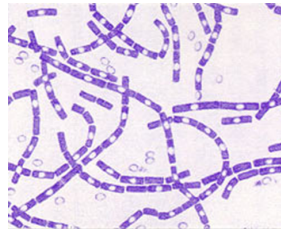
Bacillus anthracis

- Commonly occurs in ruminants (Cattle, sheep, goats, etc.)
- Humans who are exposed to infected animals or a high density of spores (endospore) will become infected.
- There are no known cases of people catching anthrax from one another.

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Anthrax can infect three different areas:

- Gastrointestinal Anthrax (intestine)
- Pulmonary Anthrax (lungs)
- Cutaneous Anthrax (Least fatal; least painful)



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Escherichia coli

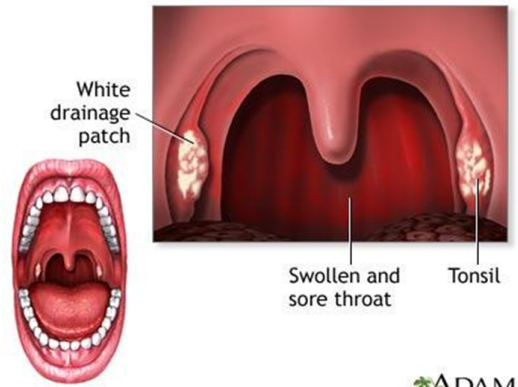


- E. Coli live in the lower intestine of many animals.
- However, they can cause several infections when they appear in an area of the body that they are not normally found.
- Ex. Urinary Tract Infections
- Sometimes E. Coli produce a toxin that attacks the body and makes us ill.
- Ex. Food Poisoning

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Streptococcus pharyngitis

- These bacteria attack the pharynx.
- These bacteria are spread through direct contact (water droplets from sneezing and coughing)



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Antibioitcs and Immunity

Antibiotics and Superbugs



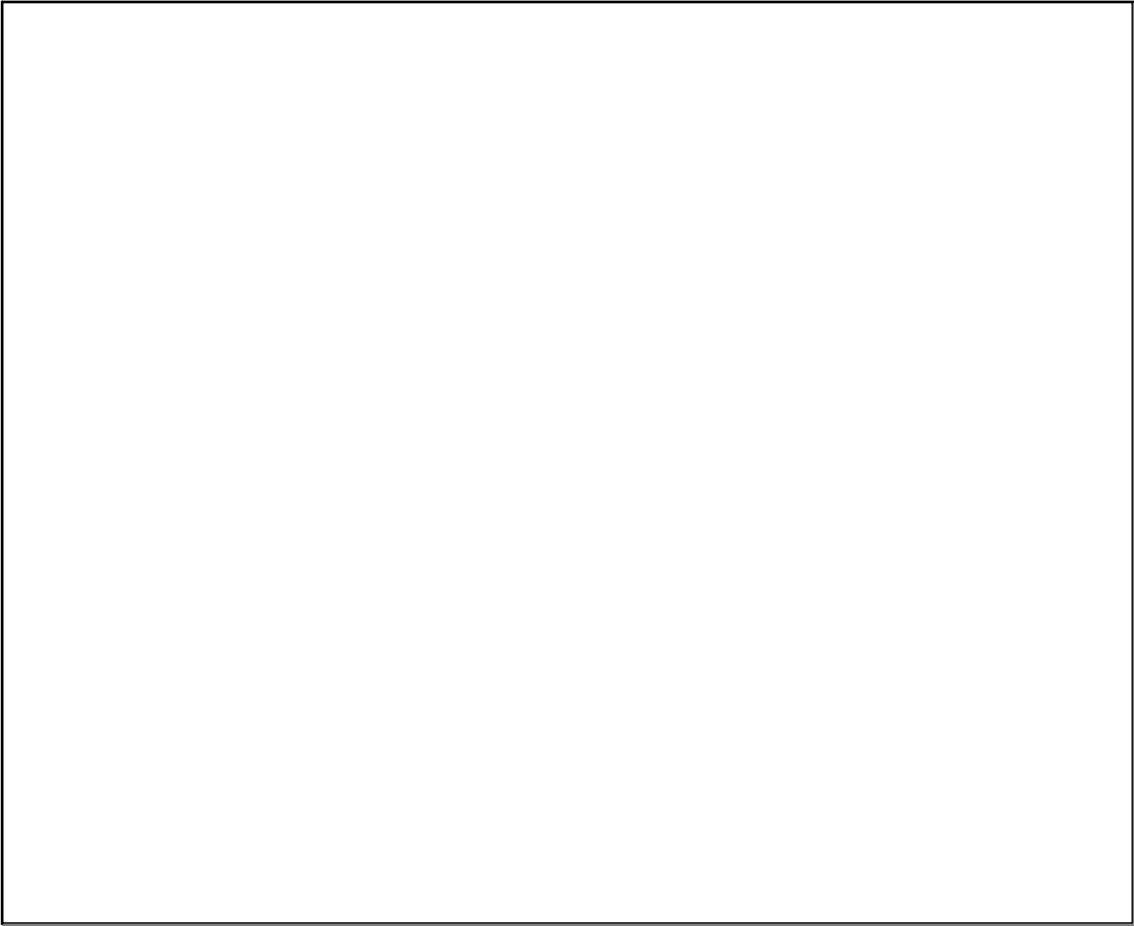
Immune response to bacteria



Immune response to bacteria 2



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